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possible bearing on field studies during the present season.

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*THE RELATION OF THE HORSEPOWER TO  
THE KILOWATT<sup>1</sup>*

THERE was, before 1911, no precise definition of the horsepower that was generally accepted and authoritative, and different equivalents of this unit in watts are given by various books. The most frequently used equivalent in watts, both in the United States and England, has been the round number, 746 watts; and in 1911 the American Institute of Electrical Engineers adopted this as the exact value of the horsepower. It is obviously desirable that a unit of power should not vary from place to place, and the horsepower thus defined as a fixed number of watts does indeed represent the same rate of work at all places. Inasmuch as the "pound" weight, as a unit of force, varies in value as  $g$  the acceleration of gravity varies, the number of foot-pounds per second in a horsepower accordingly varies with the latitude and altitude. It is equal to 550 foot-pounds per second at  $50^{\circ}$  latitude and sea level, approximately the location of London, where the original experiments were made by James Watt to determine the magnitude of the horsepower.

The "continental horsepower," which is used on the continent of Europe, differs from the English and American horsepower by more than 1 per cent., its usual equivalent in watts being 736. This difference is historically due to the confusion existing in weights and measures about a hundred years ago. After the metric system had come into use in Europe, the various values of the horsepower in terms of local feet and pounds were reduced to metric units and were rounded off to 75 kilogram-meters per second, although the original English value was equivalent to 76.041 kilogram-meters per second. Since a unit of power should represent the same rate

of work at all places, the "continental horsepower" is best defined as 736 watts; this is equivalent to 75 kilogram-meters per second at latitude  $52^{\circ} 30'$ , or Berlin. The circular gives tables showing the variation with latitude and altitude of the number of foot-pounds per second and of kilogram-meters per second in the two different horsepowers.

These values, 746 and 736 watts, were adopted as early as 1873 by a committee of the British Association for the Advancement of Science. The value, 0.746 kilowatt, will be used in future publications of the Bureau of Standards as the exact equivalent of the English and American horsepower. It is recognized, however, that modern engineering practise is constantly tending away from the horsepower and toward the kilowatt. The Bureau of Standards and the Standards Committee of the American Institute of Electrical Engineers recommend the kilowatt for use generally instead of the horsepower as the unit of power.

*THE IMPERIAL UNIVERSITIES CONGRESS*

THE Imperial Universities Congress was opened by Lord Rosebery on July 2, at the University of London, South Kensington. As we learn from the reports in the London *Times* the question of the division of work and specialization among universities was dealt with in a paper by Sir Alfred Hopkinson, and Sir Arthur Rücker and Sir Charles Waldstein spoke on the same subject. Principal Peterson, of McGill University, introduced a discussion on inter-university arrangements for post-graduate and research students.

On July 3 there were two sessions of the congress, Lord Curzon of Kedleston presiding in the morning and Mr. Balfour in the afternoon. Papers were read on the relation of the universities to technical and professional education, the interchange of university teachers, and the problem of universities in the east. The speakers and readers of papers included Sir Frederick Lugard, Sir Isambard Owen, Dr. A. E. Shipley, Sir Thomas Raleigh and

<sup>1</sup> Abstract of Circular of the Bureau of Standards, No. 34; June, 1912.